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BUILDING CHINA'S OWN MINING EQUIPMENT-- PRESENT MANUFACTURING STANDARDS NOT SUITED TO MEET DEMANDS

Superiority in mining equipment plays an important part in the improvement of labor productivity and in the development of mining and production. The speed of development in various industries depends on the supply of raw materials and fuels. Therefore, the rate of development of mining equipment affects the rate of development of the entire economy.

China started on its third 5 year plan from this year, but the policy of "placing importance in machine designs for mining and agriculture and planning for a large volume of practical and highly efficient mining and agricultural machines" was already established in December 1965 when the National Machine Products and Design Council meeting was held (NCNA, 21 Dec 1965). A conference of various industrial departments of the government held in April 1966 decided that China will start producing new and highly efficient mining facilities and equipment and also design and produce over 100 types of mining equipment suitable for mining conditions in China (NCNA, 8 Apr 1966).

Machine Facilities Fitted to Mining Conditions of China

China began placing importance on mining and production of mining facilities after the liberation. Mechanization of mines developed rapidly since then. For example, mechanization of modern mines in China increased from 77.64% in 1952 to 94% in 1957. During the same period, the use of face conveyer increased from 69.62% to 92.02%, mechanization of main shaft transportation increased from

77.9% to 85.04% and the mechanization of train loading increased from 65.16% to 90.78%. A most recent hydraulic mining was introduced in 1956.

However, in the past, the researchers and cadres of mine equipment manufacturing plants hardly visited the mines to conduct researches. They considered mining equipment to be relatively simple and required very little technical know how. Technicians of these days introduced or copied foreign made equipment which, in many cases, did not suit the mining situations existing in China (NCNA, 8 April 1966).

In November 1964, Mao Tse-tung appealed for a mass design revolution and showed a right direction toward a development of mining machineries. Cadres and designers started to carry out researches at the mines. For example, a researcher of Shanghai Machine Institute, Institute of Scientific Research of Coal, Ministry of Coal Industry carried out an operation method of "design and plan at mines, manufacture at plants and test at mines."

Many new and highly efficient mining facilities and machineries developed through the design revolution movement conform to the natural mining conditions of China. Some of the machines include thin layer coal mining combine, multi wire hoist, piercing drill, rock drill of high efficiency, large rock loader and strong magnetic ore separator.

There still exists a gap between the manufacture standard of mining equipment and the actual demand. It is said that manufacturing departments have decided to establish China's own mining machineries system as early as possible (NCNA, 8 April 1966).

The following are some of the mining facilities.

Hydraulic Mining Facility

China introduced a Soviet method of hydraulic mining in 1956. It proved superior to the dry method of mining; therefore, the emphasis was placed on the development of hydraulic mining techniques. In 1957, hydraulic mining produced 720,000 tons^{of coal} and increased to 1,670,000 tons in 1958, to 8,000,000 tons in 1959 and to 16,000,000 (planned) in 1960. There is no subsequent figures given, but it is reported that the largest coal mine at Fu-shun has been equipped with hydraulic mining system in 1965 (NCNA, 8 Oct 1965).

The hydraulic mining facility used at Fu-shun Coal Mines was studied and tested by the Fu-shun Mining Affairs Bureau, T'ang-shan Coal Scientific Institute and the related manufacturing group. This facility is made up of main pump, draft tube, coal ejector tube and tank type coaling machine. It uses water pressure which is capable of bringing up 100 tons of coal from a mine 600 meters deep every hour. It is also able to convey coal lumps of up to 120 mm in diameter and at the same time able to sort according to size and remove the refuse.

It is said that Fu-shun Coal Mines is using a flexible conveyor belt for coals operated by a water pressure. This conveyor can be brought right up to the working face and said to be twice as efficient as an ordinary conveyor.

Mining Combine

There were only two or three types of ineffective and simple mining combines in China and most of the mining was carried out manually. Chinese first

thin layer (or shallow layer) coal mining combine was developed and manufactured. This combine is capable of mining, loading, transporting, supporting shaft and moving conveyor. It is a set made up of various machines. It was proven that this type of combine is two or three times more efficient than the previously used combines. The labor force was cut into half and the degree of physical labor was lightened.

However, this combine is effective^{only}/in area of gradual sloping medium thick coal stratum; therefore, it is reported that those concerned are designing and testing new mining combines which can be used in other types of coal strata (NCNA, 8 April 1966).

Handy Cutter-Loader

The handy cutter-loader invented by workers of Ta-t'ung Coal Mines in northern China and placed into operation in 1965 proved to be very efficient. Only few men are needed to operate this machine which automatically mines and loads onto conveyor and coals are brought to surface by coal cars. This machine's degree of progress is 120- 180 meters per hour (NCNA, 14 Oct 1965).

Rock Drill

Shenyang Pneumatic Tools Plant successfully test produced eleven new types of rock drills during 1965. Out of these, six are used exclusively inside the mines. These drills range in weight from 18kg to 30kg and varies from high frequency drill for hard coal strata to dust catching drills for dry areas.

There are also light weight drills for drilling small holes and special drills for both open pit and underground mining.

Drills for open pit mines designed by the Mining Institute of Anshan Steel Company were successfully test manufactured in 1965. Most of the open pit mines in China have graduated inclines. The foreign type drills are good for vertical drilling only and are very slow. Blasting is not too effective and often requires second blasting. However, the new drill is able to drill at 45° to 90° which makes blasting more effective and breaks coal into a more uniform lumps. This angle blasting reduces the reject coal by 10% and eliminates the second blasting. This new rock drill also eliminated the use of water in drilling (NCNA, 25 Jan 1965).

A new rock drill support with automatic adjuster was test manufactured in Shensi in 1965. This support is called the T'ung 51-1. It is more versatile, lighter and more effective than the older models. The cost is only 40% of the previously produced models. The Chinese copied the foreign made 72-12 type in the past but this type has shorter stroke, less propulsion and not as versatile. The foreign type also required two men to adjust two or three times during each drilling, but the new T'ung 51-1 model is self adjusting (NCNA, 25 Aug 1965).

Boring Machine

The Peiping Mining Machine Plant has been mass producing XJ 100-1 type boring machines since 1965. This machine was designed to meet the demand for shallow drilling of up to 100 meters. A set of this machine comprised of borer, pump and diesel engine. A set can be assembled and put into operation in 30

minutes by 6 men and the mechanical and manual feed controlling devices can be interchanged freely. A rotary and hoist machines are three speed which improve the boring effectiveness (NCNA 27 Aug 1965).

In 1964, the Chang-chia-k'ou Deep Coal Mining Machines Plant in Heph started a mass production of machines capable of boring up to 1000 meters.

Conveyor

A flexible conveyor and a cable type belt conveyor are two of the new conveyers.

A heavy flexible scraper-conveyor is being used at the Fan-ke-chuang pit at Kaifan [phonetic] Mine. Yin Chi-ch'ang, an engineer at Fan-ke-chuang pit, said that "this new conveyor has a large loading capacity, is strong and durable, has very little trouble, design and quality very good." This is one of the new products of the Chang-chia k'ou Mining Machines Plant and is now being mass produced (NCNA 9 Nov 1965).

The Fu-shun Mine is using a flexible conveyor system operated by a water pressure. This type can be installed very close to the working face of a mine and the transporting capacity is almost double that of an ordinary conveyor (NCNA 8 Oct 1965).

In 1965, the Huai-nan Mining Equipment Plant manufactured a cable type belt conveyor with the cooperation of Peiping Academy of Mining and Shanghai Institute of Mining Equipment Research of the Academy of Coal Sciences. Tests conducted at Huai-nan and Kairan [phonetic] Mines proved that it performed satis-

factorily. A belt of 800 mm wide and 300 meter long is capable of transporting 350 tons per hour. The structure of this cable type belt conveyor is very simple. Cables can be attached to mine supports and over belt pulleys. It is easy to install and convenient to adjust and maintain (NCNA 13 Jul 1965).

Mining Use Loaders

A wide use machine plant in Ch'ing-hai (Tsinghai) Province succeeded in test manufacture of ore loading machine in 1965 and started on a mass production. A capacity of a bucket of this machine is 0.25 m^3 capable of loading 35 to 45 m^3 of ores per hour. This machine is superior in construction to the foreign make and many of the vital parts are more resistant to wear (NCNA 8 March 1965).

Coal Dressing Method- Coal Dressing Machine

The Fou-hsin-hai-chou Open Pit Coal Dressing Plant adopted a most recent heavy liquid coal dressing method in place of a manually operated method. In the manual method, laborers stood on both sides of a conveyor to take out the refuse. Each man had to clean out 10 to 13 tons of refuse during each working period. The work was very hard and the coal dust was detrimental to workers health. However, the use of heavy liquid coal dressing machines mechanized the operation and made the coal almost free of refuse. The ratio of coal in refuse was lowered from 12 to 1,000 to 3 to 1,000. In the heavy liquid dressing method, magnetite powder is mixed in water until it reaches a designated specific gravi-

ty and this mixture is placed in the dressing machine. A specific gravity of suspension is between specific gravity of coal and refuse. When coals pass through the dressing machine, coals float on suspension and a jig is used and transported by coal tubs after being dried. The refuse settles to the bottom and transported away in refuse tubs after water has been shaken off (NCNA, 10 Jan 1966).

Shenyang Mining Equipment Plant succeeded in manufacture of highly magnetic ore separator. A mass production of this machine is expected to start this year (NCNA 8 April 1966).

The Institute of Mining and Metallurgy of the Chinese Academy of Sciences has completed researches on heavy liquid circulating tin ore dressing four layer spring and table, inclined density machine, fan shape tank and tin ore floating dressing facility within a year. (Kuang-ming Jih-pao, 14 Apr 1966)

New Air Compressor for Mining

An air compressor usable in coal mines was manufactured by the Shenyang Gas Compressor Plant in early 1966. This is the first time a compressor of this type was produced in China. It is compact and easy to operate. Formerly, compressed air was sent through a pipe of 1,000 to 2,000 meters long. This new compressor cut the pipe length to about 100 meters. It is equipped with automatic controls and safety features. Whenever there is a lack of water or oil and the compressor becomes too hot, the compressor stops automatically. (NCNA 15 Jan 1966)

Concrete Blower

Concrete blower, a new device for construction of mining tunnels, was successfully test manufactured recently through a cooperative efforts of the Research Academy of Construction of the Ministry of Metallurgical Industry, No.3 Metallurgical Construction Company and the No. 4 Mining Company. All permanent type mines are being reinforced with concrete, pre-cast concrete blocks and with pre-cast ferre concrete , but this requires time and the work is complicated which interferes with the mining operation.

The newly developed concrete blower eliminates most of the defects and the concrete can be blown on more securely with compressed air. The concrete of same consistency blown is 1.5 to 5 times stronger and firms much faster.

This method of covering work in tunnels save 40 - 50% of lumber and concrete and cut down the labor force by one-half or one-third. The work can be completed 3.5 to 4.5 times faster and the cost can be reduced by 50%. This method is now being applied in new mines (NCNA, 11 Apr 1966).

Small Mortar Mixer for Mines

P'ing-ting-shan Mine in Henan Province achieved good results in the use of mortar mixer (or agitator) in the construction of mines. A bag of cement requires 10 to 15 minutes of mixing by two men but the mortar mixer can do the same work in 3-4 minutes with only one man (NCNA, 20 Jul 1965).

Supervisory Signal Panel

A supervisory signal panel is used in giving production commands at four mines in P'ing-ting-shan Mines in Henan Province. All commands in the past were given over telephones installed at various coversns, work shops, mining areas and at working faces. An overall production picture was obtained only by looking at various charts. Since the use of supervisory signal panel started, operations of facilities and general production conditions can be grasped from signal lights, electric clocks and bells. Commands to all parts of the mines can be given at any time through a carrier telephone (NCNA, 20 July 1965).

Safety Devices

A great effort is given in production safety and accident prevention. Some of the new products for safety are as given below.

High voltage leak relay:

A high voltage leakage inside a mine may cause^{an} explosion. In order to prevent this, an automatic device called the high voltage leak relay was developed by the A-ch'eng Relay Plant in Heilungkiang in 1965. A test ~~was~~ conducted at the Huai-nan Coal Mine proved that this protective relay device using a new semi-conductor techniques was very good. (NCNA, 5 Oct 1965)

Gas Automatic Alarm:

Chung-liang-shan Coal Mine in Chungking produced an automatic gas warning device. This device is placed in an exhaust room. A rubber tube attached to the device is able to detect the changes in^a gas flow. Whenever a gas flow exceeds

a danger point, a red light appears so that a person in charge can take a proper measure to prevent any accident (NCNA, 6 Mar 1966).

Multiplying air machine foam fire extinguishing method:

The No.2 Laboratory of the Fushun Coal Institute succeeded in testing a method using foams to extinguish fires after six years of work. It is possible to extinguish a fire in a mine from a distance of up to 100 meters away which ensures safety of workers. This method is now being used in P'ing-ting-shan, Fou-hsin, Fu-shun and other mines are already using this method.

The No.2 Laboratory started on the new fire extinguishing techniques in 1958. They collected over twenty types of foaming materials and decided on the cheapest, highest performing and high moisture content foaming agent. They built a revolving leaf type foam nozzle and a spindle shape discharging net. This discharger produces over 100 m³ of foams per minute. It is able to put out a raging fire in 20 - 30 minutes. The only drawback of this equipment is that it is quite heavy (NCNA, 28 Jan 1966).

In addition to above, the Wuhan Metallurgical Safety Technique Institute developed a new type anti-dust atomizer to guarantee against explosion and a explosion velocity measuring instrument to improve the blasting efficiency.

Water blast exhaust device, various drills with moist or dry dust absorbers [or exhaust] and filtering techniques are being taken up to cope with the coal dust situation. A test on photo-electric and static electric dust measuring devices are being carried out.